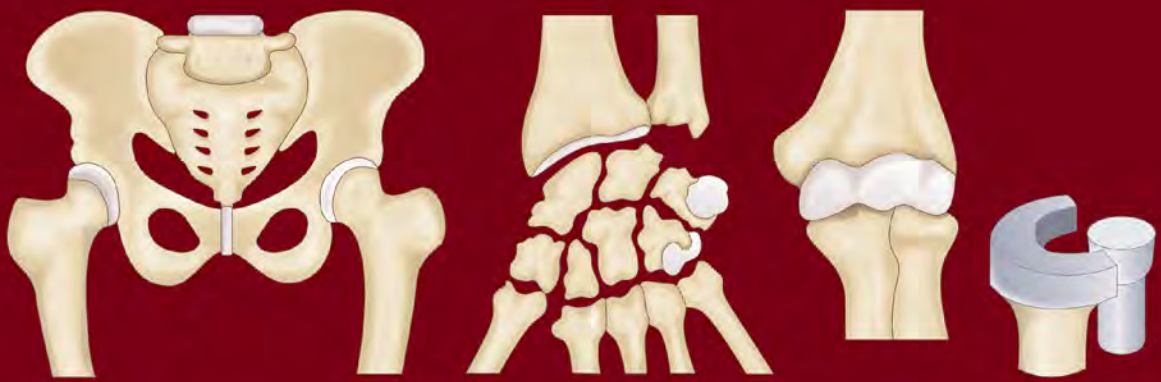
S Lakshmi Narayanan's

Textbook *of* THERAPEUTIC EXERCISES



Revised by

Basanta Kumar Nanda

2nd Edition

JAYPEE

Contents

3

CHAPTER

Assessment, Examination and Evaluation of Neuro-musculoskeletal System

INTRODUCTION

Management of patients with diseases and disorders involving various systems of the body and persons with disabilities, involves an interdisciplinary (involving many professionals in one campus) or multidisciplinary approach (involving professionals where services are not available in one campus, and patient is referred outside, if need arises). For effective management, the patient should be assessed by different professionals, and the problems of the patient/PWD need to be identified for deciding the treatment protocols after a thorough clinical reasoning. Besides, initial assessment, the client should be reassessed periodically to judge improvements of the condition.

Assessment

Assessment is defined as a methodical way of acquiring, reviewing and using information about someone or something, so as to make improvement where necessary. It is a systematic process for measuring an individual's abilities based on collected data, received through examination.

Examination

It involves both subjective examination (history of patient) to get qualitative data, and objective examination, where tests and measures are done for various systems to find quantitative data with a numerical value, showing the patient's impairments.

Evaluation

It is an objective judgment of the skills and values of a person using well-defined criteria. It is one step away from standardized testing/examination helping to derive a working hypothesis. A good evaluation process should be valid, reliable, and practical.

Documentation

It is the record of the patient's health status and medical condition, reflecting the patient's impairment data, care provided, the effect and continuity of care. Problem-oriented Medical Records (POMR), is a method of documentation, that records the healthcare status of the individual, the investigations performed and treatment planned.

Problem-oriented Medical Record

Problem-oriented Medical Record (POMR), developed by Dr Lawrence Weed in late 1950s is a method of recording data, about the healthcare status of the patient in a problem-solving system, in an easily accessible way, that encourages ongoing assessment and revision of the healthcare plan. This approach provides the clinician a view of the patients' data as an orderly process to solve their problems, giving the opportunity to make explicit hypotheses and clinical decisions. The phases of POMR include:

Phase 1

The formation of a database, including history, physical examination and laboratory and other test results.

Phase 2

Identification of a specific problem list from the interpretation of the database, including specific impairment of function (physical, psychological, social and vocational) resulting from the disease process or from secondary impairments.

Phase 3

Identification of a specific plan of care (POC) that includes interventions for each of the problems described; evaluative and progress notes are included for each problem.

Phase 4

Determination of the effectiveness of the plan of care (POC) and subsequent changes as a result of patient progress.

SOAP, an acronym for subjective, objective, assessment plan, originates from POMR, for documenting the daily progress notes of the patient. SOAP notes are a highly structured format for documenting the progress of a patient during treatment and is only one of many possible formats that could be used by a health professional. They are entered in the patient's medical record by healthcare professionals to communicate information to other providers of care, to provide evidence of patient contact and to inform the clinical reasoning process. The four components of SOAP are:

1. **Subjective:** Where a client's subjective experiences, feelings, or perspectives are recorded. This might include subjective information from a patient's guardian or someone else involved in their care.
2. **Objective:** For a more complete overview of a client's health or mental status, objective information in the form of ROM, outcome measures of tests performed, etc., must also be recorded. This section records substantive data, such as facts and details from the therapy session.
3. **Assessment:** This involves, the clinician/therapist's analysis of various components of subjective and objective data.
4. **Plan:** This outlines the future actions for the patient. It talks about development of a best treatment strategy to reach the goals/objectives.

Procedure of Assessment of Neuromuscular System

It consists of the followings:

Demographic Data

Name, age, gender, address.

Subjective Examination

- **History of present illness:** How and when the present problem started.
- **Past history:** History of past injury/illness, relevant to the current problems.
- **Family history:** Family structure (nuclear/joint family), family's support system, genetic inheritance (if any).
- **Personal history:** Educational qualification, occupation, marital status, number of children (if married), dietary habits, addictions of tobacco/alcohol, etc.
- **Socio-economic history:** Lives in urban/rural areas, family's monthly/annual income.
- **Functional history:** Information about patient's functional abilities/limitations.

Objective Examination

- Observation of posture and movements
- **Higher function examination:** Level of consciousness, speech, hearing, vision, memory, intelligence, orientation, concentration.
- Cranial nerve involvement (if any) **(Table 3.1)**.

Table 3.1: Clinical examination of cranial nerves.

Nerve number	*Nerve name*	*Functional loss*	*Testing procedure*
1st	Olfactory	Smell	A small amount of oil of peppermint and oil of cloves are taken in two small test tubes. The tubes are brought near each nostril separately, one after the other. The patient is asked, if he can identify the smell or not. Inability to identify the smell, indicates injury to 1st cranial nerve, resulting in anosmia
2nd	Optic	Visual acuity and visual field	Visual acuity is tested using a Snellen Eye Chart placed 20 feet away from the patient, making the patient read letters of various sizes. It must, of course, be remembered that loss of acuity of vision can be caused by errors of refraction, or by the presence of opacities in the cornea or the lens (cataract). Visual fields are tested by direct confrontation (the confrontation test). Each eye is tested individually, with the other eye covered **(Fig. 3.1)**. The examiner stands/sits 3 feet away from the patient, and the patient focuses on the examiner's eyes or nose. A pen or a finger is moved toward the center of the visual field in all four quadrants, and the patient will indicate when they can see the object. Alternatively, a select number of fingers are held up in a quadrant and have the patient identify how many fingers they see. This is repeated for all quadrants. If an abnormality is detected, confirmation should be done through perimetry
3rd	Oculomotor	Opening of eyelid affected, eyeball movement limitation causing double vision, as the affected eye turns slightly downward and outward and the unaffected eye looks straight. The affected eye may turn inward very slowly and may move only to the middle when looking inward. It cannot move up and down	The 3rd nerve has two major components, the outer parasympathetic fibers that supply the ciliary muscles and the sphincter pupillae, and the inner somatic fibers supply the levator palpebrae superioris in the eyelid (which retracts the upper eyelid) and the four extraocular muscles (superior, middle, inferior recti, and inferior oblique). In oculomotor nerve palsy, the involved eye would deviate downward and laterally at rest with ptosis. This nerve is tested by checking pupillary constriction and eyeball movement in upward/medial, upward/lateral, medial and downward/lateral direction. The pupillary light reflex is tested by shining a light into each eye and observing the pupil response. Ocular movements are tested by holding a pen or finger 30 to 40 cm in front of the patient and moving in an H-shaped pattern pausing during vertical and lateral gaze. The patient should follow the target with their eyes, carefully keeping their head still. The eyeball move normally 50° outwards, 50° inwards, 33° upwards, and 50° downwards. Limitations of movement of eyeball upwards (levator palpebrae superioris, superior rectus muscle), medial (medial rectus muscle), downwards (inferior rectus muscle) indicate 3rd nerve palsy
4th	Trochlear	Intorsion (Internal rotation), depression, and abduction of the eyeball will be impaired	The trochlear nerve innervates the superior oblique muscle. Patients with trochlear nerve palsy often tilt their heads away from the affected eye and may have strabismus. It is tested in the same manner like oculomotor nerve, and any impairment of eyeball movement in the downward and outward direction suggests injury to this nerve. The dysfunction is usually incomplete as the oculomotor and abducens nerves also depress and abduct the eye

Contd...

Contd...

Nerve number	*Nerve name*	*Functional loss*	*Testing procedure*
5th	Trigeminal	Sensation of face and posterior 1/3rd of tongue and chewing movements will be impaired	***Motor Functions*** Motor function of the trigeminal nerve is tested by having the patient open their mouth against resistance. If weakness is present, the jaw will deviate to the side of weakness/paralysis, the healthy lateral pterygoid muscles pushing it to that side. With the patient's teeth clenched, palpation of the masseter and temporal muscles, revealing reduced prominence on the affected side, showing asymmetry of face, indicate lesion to trigeminal nerve. ***Sensory Functions*** Testing for impairment of sensations for touch, pain and temperature over the entire face and over posterior one-third of the tongue reveals lesion to this nerve. Testing of the corneal reflexes on both sides and finding it is loss on one side, reveals injury to the 5th nerve. The sensation of the angle of the mandible should be tested if the facial sensation is diminished, as the C2 spinal root innervates this area. Sparing of the angle of the jaw is indicative of trigeminal pathology
6th	Abducens	Impairment of movement of eyeball (laterally)	Abducens nerve innervates the lateral rectus muscle. It is tested in the same manner, such as oculomotor nerve, and any impairment of eyeball movement in the lateral direction suggests injury to this nerve
7th	Facial	Facial muscle movements (except chewing) and closing of eyelids will be affected, causing ipsilateral facial palsy. Impairment of taste sensation over anterior 2/3rd of tongue	The facial nerve supplies the muscles of the face including the muscles that close the eyelids, and the mouth. The nerve is tested as follows: The patient is asked to close his eyes firmly. In complete paralysis of the facial nerve, the patient will not be able to close the eye on the affected side. In partial paralysis, the closure is weak. The person is asked to smile. In smiling, the normal mouth is more or less symmetrical, the two angles moving upwards and outwards. In facial paralysis, the angle fails to move on the paralyzed side. The patient is asked to fill his/mouth with air. The clinician presses the cheek of the patient with the fingers and compare the resistance (offered by the buccinator muscle) on the two sides. The resistance is less on the paralyzed side. On pressing the cheek air may leak out of the mouth because the muscles closing the mouth are weak. The sensation of taste should be tested on the anterior two-thirds of the tongue. To evaluate taste, the patient is asked to stick out the tongue and close the eyes. A small amount of salt (for salty), quinine hydrochloride or caffeine strips (for bitter), tartaric acid (for sour), or sugar (for sweet) are applied to the lateral surface and side of the anterior tongue, then have the patient identify the substance

Contd...

Contd...

Nerve number	*Nerve name*	*Functional loss*	*Testing procedure*
8th	Auditory (Vestibulocochlear)	Impairment of hearing and balance	This nerve is responsible for hearing (cochlear part) and for equilibrium (vestibular part). Initial hearing testing is conducted by rubbing the fingers/whispering close to one ear while occluding the other, then repeating for the other ear. Any asymmetry in response or hearing should be noted. Further evaluation using the Rinne and Weber tests is warranted if hearing loss is suspected, which helps to distinguish conductive from sensorineural hearing loss. The Rinne test is performed by placing a vibrating 512-hertz tuning fork on the mastoid process, and once the sound is no longer heard, moving the fork to just outside the ear. In a normal (positive) Rinne test, air conduction is greater than bone conduction. In an abnormal (negative) Rinne test, bone conduction is greater than air conduction in the affected ear. A patient with profound sensorineural hearing loss may not hear anything from the tuning fork placed on the mastoid process or near the external auditory canal. The Weber test is performed by placing a vibrating 512-hertz tuning fork on the center of the forehead. Sound is louder in, or "lateralizes to," the ear experiencing conductive hearing loss or opposite the ear with sensorineural hearing loss. To assess vestibular function, testing for nystagmus is made and the direction, duration, and trigger of the nystagmus are noted. Note should be made for the patient experiencing vertigo during examination
9th	Glossopharyngeal nerve	Taste sensation from posterior 1/3rd of tongue, may be affected. Unilateral damage to the glossopharyngeal nerve results in the absence of a gag response when that side of the pharynx is stimulated and poses difficulty in swallowing	Sensations of taste can be tested by applying substances that are salty (salt), sweet (sugar), sour (lemon), or bitter (quinine) to the posterior one-third of the tongue. The mouth should be rinsed and the tongue dried before the substance is applied. The client is instructed to say "ah" and yawn to observe upward movement of the soft palate. The gag reflex should also be tested. Difficulty in swallowing and impaired gag reflex indicates damage to this nerve The gag reflex, also known as the pharyngeal reflex, is an involuntary reflex involving bilateral pharyngeal muscle contraction and elevation of the soft palate on touching the palatal arches with cotton swab. If the glossopharyngeal nerve is damaged on one side, there will be no response when touched (unilateral absence of gag reflex)
10th	Vagus	Sensation to larynx, motor function to soft palate, pharynx, larynx, and esophagus may be affected, causing difficulty in swallowing	The patient is asked to open the mouth wide and say 'aah'. The clinician observes the movement of the soft palate. In a normal person, the soft palate is elevated. When one vagus nerve is paralyzed the palate is pulled towards the normal side. When the nerve is paralyzed on both sides the soft palate does not move at all. The gag reflex may be absent. There is also hoarseness of voice, due to injury to superior laryngeal nerve (causing temporary hoarseness) and recurrent laryngeal nerve (causing permanent hoarseness)

Contd...

Contd...

Nerve number	*Nerve name*	*Functional loss*	*Testing procedure*
11th	Accessory	Shrugging of shoulder, lateral flexion of neck to the tested side and rotation to the opposite side is weak/impaired	The clinician puts his/her hands on the right and left shoulders of the patient and ask him to elevate (shrug) the shoulders. In injury to this nerve, the movement will be weak/impaired. Testing the power of sternocleidomastoid also reveals impairment (if any) of functioning of this nerve
12th	Hypoglossal	Impairment of movement of tongue	To test the nerve, the patient is asked to protrude the tongue. In a normal person, the protruded tongue lies in the midline. Atrophy, fasciculations, and deviation of the tongue in the direction of the lesion are associated with lower motor neuron pathology. The tongue deviates away from the lesion with upper motor neuron pathology, and there will not be atrophy or fasciculations

Fig. 3.1: The confrontation test.

Sensory System Examination

Sensations may be classified into categories by various methods dependent on anatomic or functional criteria. An anatomic classification divides sensory function into:

1. Somatic sensation
2. Visceral sensation

However, clinically, only somatic sensation can be tested and documented.

One functional classification separates sensory modalities into simple affective sensations, termed protopathic, and sensations that provide discriminative analysis with regard to the environment, termed epicritic.

The Epicritic Sensation/System

It is concerned with touch discrimination and small changes in temperature. Epicritic neurons detect gentle touch, such as light vibrations; the ability to recognize the shape of an object being held (stereognosis), tactile localization, tactile discrimination, two-point discrimination, etc. Example: Fine touch, vibration, stereognosis.

Protopathic Sensation/System

It is primitive and concerned with diffuse pain, extremes of temperature, etc. It is the sensibility to strong stimulations of pain and temperature. It is low in degree and poorly localized, existing in the skin and in the viscera, and acting as a defensive agency against pathologic changes in the tissues. Example: Pain, pressure and temperature sensation.

A more practical classification that utilizes both anatomic criteria including the types and locations of end organs and functional criteria, classify sensory modalities into:

- **Exteroceptive sensation**
- **Proprioceptive sensation**
- **Cortical sensation**

Exteroceptive Sensation (also Termed Superficial Sensation)

Receptors are present in the skin and mucous membranes. These include:

- **Tactile or touch sensation (thigmesthesia):** Impairments could be:
  - *Anesthesia:* Absence of touch appreciation.

- *Hypoesthesia:* Decrease of touch appreciation.
- *Hyperesthesia:* Exaggeration of touch sensation.

❖ **Pain sensation (algesia): Impairments could be:**
- *Analgesia:* Absence of pain appreciation.
- *Hypoalgesia:* Decrease of pain appreciation.
- *Hyperalgesia:* Exaggeration of pain appreciation, which is often unpleasant.

❖ **Temperature sensation—both hot and cold (thermesthesia): Impairments could be:**
- *Thermanalgesia:* Absence of temperature appreciation
- *Thermhypesthesia:* Decrease of temperature appreciation
- *Thermhyperesthesia:* Exaggeration of temperature sensation.

Sensory perversions: In patients with sensory perversions, the sensory system is disordered; sensations may be diminished, increased, or distorted. These include:

❖ **Hyperpathia:** Indicates a lowered threshold for painful sensation.

❖ **Paresthesias:** Abnormal sensations perceived without specific stimulation. They may be tactile, thermal or painful and are either episodic or constant.

❖ **Dysesthesia:** Painful sensations, such as intense burning, elicited by a nonpainful cutaneous stimulus, such as a light touch or gentle stroking over affected areas of the body. Sometimes referred to as hyperpathia or hyperalgesia.

❖ **Allodynia:** Painful response to non-painful stimulus.

Proprioceptive Sensation (also Termed Deep Sensation)

Receptors are located in muscles, tendons, ligaments and joints. These include:

❖ **Joint position sense at rest/Proprioception (Arthresthesia)**

❖ Vibratory sense (Pallesthesia)

❖ **Kinesthesia:** Perception of motion

Cortical Sensation

Interpretative sensory functions that require analysis of individual sensory modalities by the parietal lobes to provide discrimination. The different sensory modalities are:

❖ **Stereognosis:** Ability to recognize and identify objects by feeling them. The absence of this ability is termed astereognosis.

❖ **Graphesthesia:** Ability to recognize symbols written on the skin. The absence of this ability is termed Agraphesthesia.

❖ **Two-point discrimination:** Ability to recognize simultaneous stimulation by two blunt points. Measured by the distance between the points required for recognition.

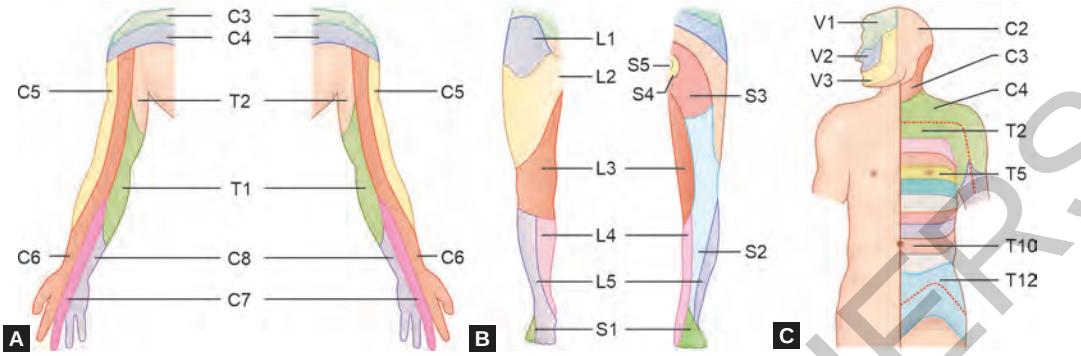
❖ **Touch localization (topognosis):** Ability to localize stimuli to parts of the body. Topagnosia is the absence of this ability.

❖ **Double simultaneous stimulation:** Ability to perceive a sensory stimulus when corresponding areas on the opposite side of the body are stimulated simultaneously. Loss of this ability is termed sensory extinction.

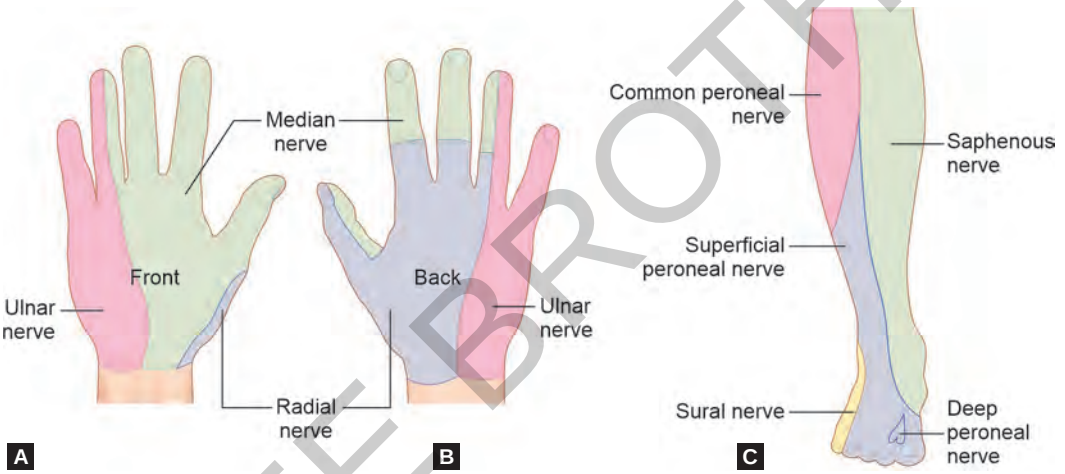
Before sensory examination, the clinician should be thorough about the dermatomes and sensory distribution of the peripheral nerves.

The dermatomes (areas of the skin whose sensory distribution is innervated by the afferent nerve fibers from the dorsal root of a specific single spinal nerve root,) of the upper limb, lower limb and trunk are shown in the following figures **(Figs. 3.2A to C)**.

For the sensory testing of a particular peripheral nerve, recording should be made on body chart **(Figs. 3.3A to C)**. The cutaneous distribution of nerves of upper limb and lower limb are shown in **Figures 3.4A to D**. Depending upon, the sensory impairment noted, body chart diagram showing the affected part should be drawn and sensory



Figs. 3.2A to C: (A) Dermatomes of upper limb; (B) Dermatomes of lower limb; (C) Dermatomes of trunk.



Figs 3.3A to C: (A and B) Body chart showing sensory supply of ulnar/median/radial nerve in hand; (C) Body chart showing the sensory distribution in the front of leg.

impairments in the form of "absent", "reduced", "normal" should be indicated symbolically.

Instruments Required for Sensory Testing

The test requires instruments, such as cotton wisp, Neurotip pins, test tubes containing hot and cold water, 128 Hz tuning fork.

Grading of Sensory Impairments

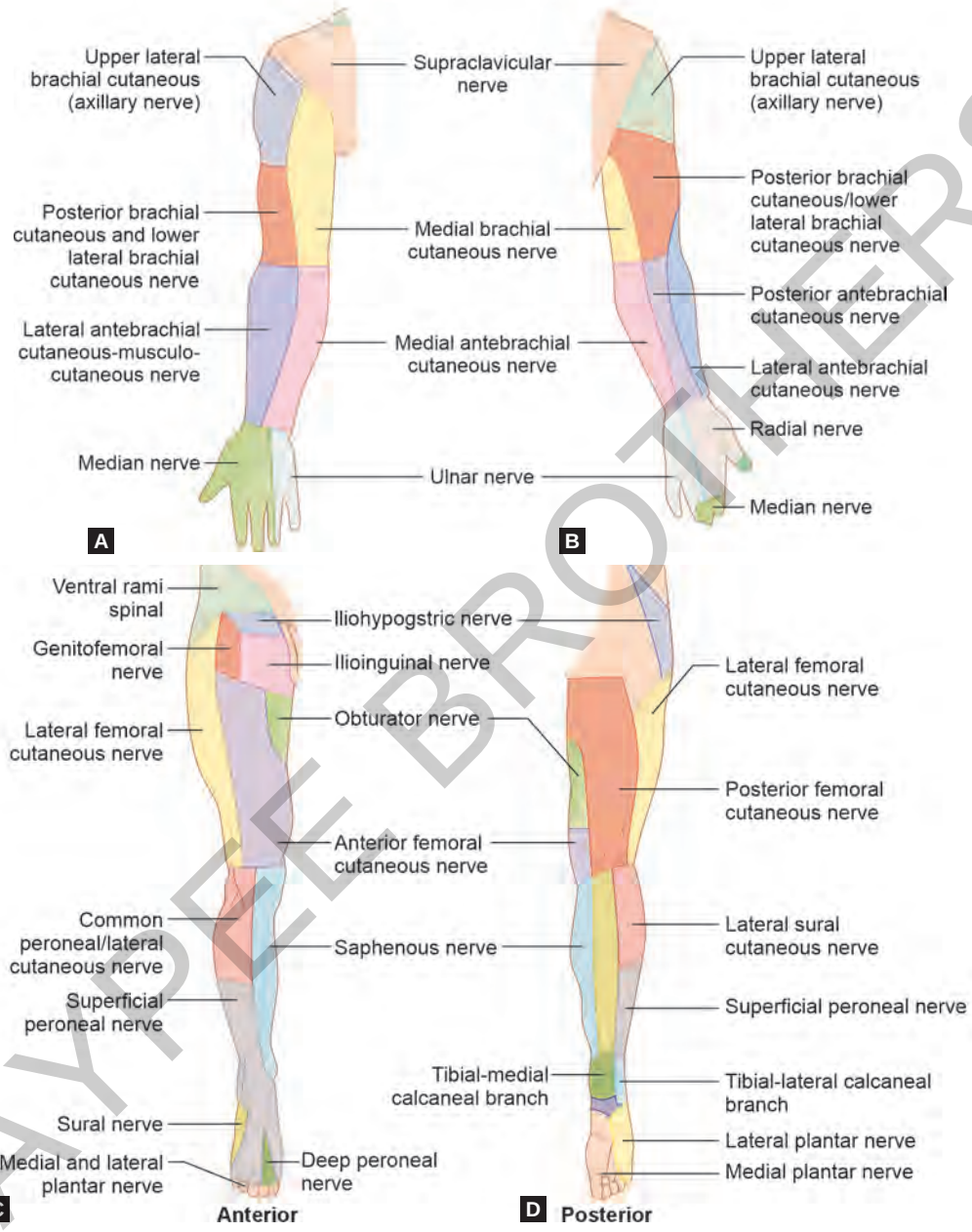
Sensation can be graded using 0–10 scale, such as VAS, where 0-Complete anesthesia, 10-Normal sensation. However, using ASIA, grading system, sensation can be graded using **Table 3.2**.

Methods of Testing of Different Sensations

Before sensory testing, informed consent should be obtained from the patient/caregiver. The area to be tested, should be properly exposed, taking due precaution to maintain privacy of the individual. The methods of assessment are:

Light Touch

A wisp of cotton wool or fine brush is gently tapped over the manubrium or the vertex of skull or any other intact area as a reference point for normal feeling. The patient is asked to close the eyes, to eliminate the possibility



Figs. 3.4A to D: (A) Cutaneous/sensory distribution on front of upper limb; (B) Cutaneous/sensory distribution on back of upper limb; (C) Cutaneous/sensory distribution on front of lower limb; (D) Cutaneous/sensory distribution on back of lower limb.

of wrong information given due to visual substitution and respond when the stimulus is detected. The stimuli are then applied to dermatomal area/cutaneous supply zones of nerves **(Fig. 3.5)**, with random application and withholding, to get correct response

Table 3.2: Shows grading of sensation.

Grade	*Criteria*
0	Absent
1	Altered
2	Normal
NT	Not testable

Fig. 3.5: Testing light touch.

from the patient. The test should be done in a caudocranial direction, and the cotton should not be dragged over the skin. Comparison should be done with the sound side.

Pain

Neurological pins, such a Neurotips (single use neurological examination pins)/blunt end of percussion hammer are used to assess superficial pain. A reference stimulus should be established as was explained for the light touch stimulus using both the sharp and blunt end of the test instrument. The dermatomes should be assessed in an ascending manner, i.e., in distal to proximal direction and always a constant pressure is applied **(Fig. 3.6)**. Alternation between the sharp end of the neurological pin and the blunt end should be made randomly while testing. Patients with impaired superficial pain sensation will report the stimulus as being dull or not feeling it at all.

Temperature

Both hot and cold test tubes are used randomly to find hot and cold sensitivity.

Fig. 3.6: Testing the superficial pain sensation.

Proprioception/kinesthesia

The ability to recognize the location of a body part with respect to the environment (when the joint is at rest) is known as proprioception. This sensory modality is assessed by testing the joint position sense of the patient at rest. The procedure for testing proprioception for PIP joint of fingers is shown below.

The clinician should hold the DIP of patient's great toe/thumb/finger, between the thumb and index finger of left hand and gently holds the proximal phalanx with the right hand. Small amplitude movements using left hand is made to demonstrate up and down movements with the eyes open **(Fig. 3.7)**. Then the same procedure is repeated with the eyes closed. The patient is asked to indicate the position of the moving segment (whether placed up or down for

Fig. 3.7: Testing proprioception/kinesthesia of PIP joint of index finger.

proprioception and moving up and down for kinesthesia). If the patient fails to tell the joint position at rest/in motion, the amplitude of movement is increased to find the response. If no response is found in the distal joint testing of the proximal joints should be made in the following order.

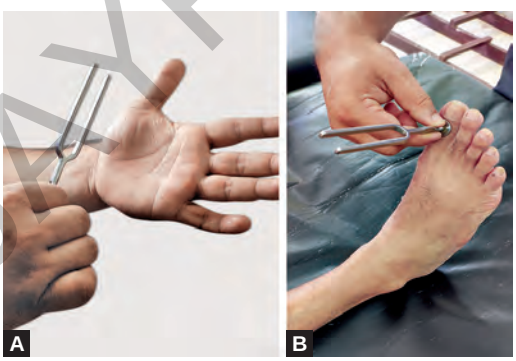
The order of testing of proprioception/kinesthesia:

Upper limb: DIP → PIP → MCP → Wrist → Elbow → Shoulder

Lower limb: DIP → PIP → MTP → Ankle → Knee → Hip

Vibration

Tested using a 128 Hz tuning fork. To initiate the test, the clinician strikes the prongs of the tuning fork against his/her thenar eminence of the hand to initiate vibration. By holding the tuning fork at the stem (not at the prongs), a reference stimulus is established by placing the foot piece of the vibrating tuning fork at the vertex of the head or the manubrium of the patient. Subsequently, the prongs are struck against the hand to restart the vibrations **(Fig. 3.8A)** and the foot piece of the vibrating tuning fork is placed on the most distal bony prominence (e.g., IP joint of great toe) with the patient's eyes closed **(Fig. 3.8B)**. The patient should be able to tell when he/she first noted the stimulus and when it stopped. If the patient is able to identify and characterize the stimulus at the most distal point, then there is no need to move to the next bony prominence. However, if he is unable to identify the stimulus, then the next bony prominence (i.e., the metatarsophalangeal joint of the great toe, medial malleolus, tibial tuberosity, anterior superior iliac spine) is tested in the ascending manner. The same procedure should be followed for the upper limbs.



Figs. 3.8A and B: (A) Vibrating the tuning fork; (B) Testing vibration sensation on great toe.

Cortical Sensation

Cortical sensation does not need to be assessed routinely. It is not necessary to test cortical sensation in patients with spinal cord or peripheral nerve lesions. If the patient's symptoms are due to lesion to right hemisphere, examination of cortical sensation may be helpful. The cortical sensory modalities, include tactile discrimination (graphesthesia, stereognosis, two point discrimination, extinction), tactile localization, barognosis.

Graphesthesia

Graphesthesia refers to the ability to detect the tracing of letters or numbers on the skin just by feeling it (i.e., without visual input). It is assessed by using a blunt object to make tracings of letters or numbers on the palms of the patient while their eyes are closed **(Fig. 3.9)**. The patient should be able to tell the examiner what letter or number was outlined if this modality is intact.

Stereognosis

Stereognosis (also known as haptic perception or tactile gnosis) is the ability to perceive and recognize the form of an object in the absence of visual and auditory information. It is tested by asking the patient to close the eyes, and placing a relatively common object like a pen, coin or a key **(Fig. 3.10)** in his palm. With stereognosis intact, the patient should be able to identify the object without trouble.

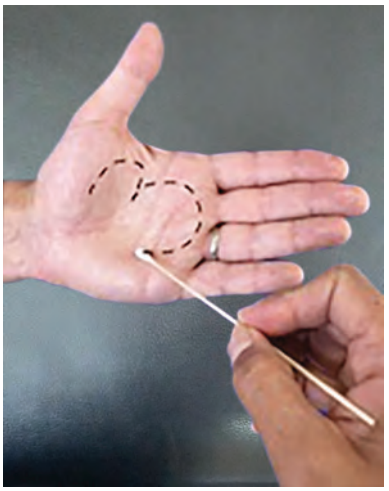


Fig. 3.9: Tests for graphesthesia.

Fig. 3.10: Test for stereognosis.

Two Point Discrimination

The two-point discrimination test is used to assess if the patient is able to identify two close points on a small area of skin. It is the most sensitivity test for cortical sensory impairment. It is a measure of tactile agnosia, or the inability to recognize these two points despite intact cutaneous sensation and proprioception. The examiner uses a paper clip, two-point discriminator, or calipers to apply pressure on two adjacent points in longitudinal direction

Fig. 3.11: 2-point discrimination test on palm of hand.

and perpendicular to the long axis of the finger/body part **(Fig. 3.11)**. The distance between the two points are gradually reduced, till the patient begins to commit error. The minimal distance, between the two points, where two points are perceived separately, and beyond which the two points are perceived as 1, is noted and compared with the normal values.

- Normal values of two point discrimination:
  - *Finger tips:* 2–8 mm
  - *Lips:* 2–4 mm
  - *Palm:* 8–12 mm
  - *Back of hand:* 20–30 mm
  - *Dorsum of foot:* 30–40 mm

Extinction

To test for extinction, the examiner should touch same areas on both sides of the body of patient simultaneously with the patient's eyes closed **(Fig. 3.12)**. Failure of the patient to perceive touch on one side is called the extinction phenomenon. Normally, sensation is perceived on both sides. Severity of extinction can be assessed by increasing the intensity of stimulus.

Barognosis

It is a test for tactile perception of weight. To test for intact barognosis, a set of small objects

S Lakshmi Narayanan's Textbook of Therapeutic Exercises

Salient Features

- *S Lakshmi Narayana's Textbook of Therapeutic Exercises*, thoroughly revised second edition, covers the entire subject on exercise therapy and massage, starting from principles and various sections of exercise therapy to assessment of neuromusculoskeletal diseases/disorders. It includes 250 multiple choice questions (MCQs) with answer keys.
- The chapters have been presented in a very simple manner with suitable diagrams/photographs for easy understanding of the students.
- Includes separate chapters on Hydrotherapy, Massage, and Breathing Exercises.
- The chapters on Peripheral and Spinal Mobilizations have been presented with suitable photographs for easy understanding.
- The chapter on Proprioceptive Neuromuscular Facilitation (PNF) has been presented with suitable photographs/diagrams for easy perception of the reader.
- Includes a chapter on traction, which discusses the various types of traction and selection of traction parameters to be applied to patients with musculoskeletal disorders.
- The chapters on gait and walking/mobility aids give a thorough insight about assessment and remediation of locomotion issues of patients and persons with disabilities.
- The Author and Editor have utilized their vast experience to prepare the book for benefit of the students.

Basanta Kumar Nanda BPT (Hons) MPT is presently working as Lecturer in Physiotherapy at Swami Vivekanand National Institute of Rehabilitation Training and Research, Olatpur, Cuttack, Odisha, India. He has nearly 31 years of experience in various positions as a Physiotherapist, including 18 years experience in teaching the undergraduate and postgraduate students of Physiotherapy. He had the opportunity to work at Thakur Hari Prasad Institute of Research and Rehabilitation for the Mentally Handicapped, Hyderabad, Andhra Pradesh, India, and Sanjay Gandhi Post Graduate Institute of Medical Sciences, Lucknow, Uttar Pradesh, India. He has authored two books, namely *Electrotherapy Simplified* and *Textbook of Physiotherapy*. He is a recognized resource person for various CMEs/workshops across the country.

Printed in India

Available at all medical bookstores or buy online at www.jaypeebrothers.com

JAYPEE BROTHERS
Medical Publishers (P) Ltd.
EMCA House, 23/23-B, Ansari Road,
Daryaganj, New Delhi - 110 002, INDIA
www.jaypeebrothers.com

Join us on facebook.com/JaypeeMedicalPublishers

Shelving Recommendation
PHYSIOTHERAPY